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observations to the vicinity of the Pleiades, and in the later ones to that of *Aldebaran.* Upon the whole its boundaries were not so well defined as in 1853.

I have observed occasional sudden variations in its brightness, but have been unable to detect anything like a periodicity in these changes; and knowing the great influence of atmospheric causes on objects having low altitude, I should hesitate to ascribe them to a real variation in the brightness of the light. Generally speaking, when best seen, the brilliancy was greater than that of the milky way, which was usually visible at the same time in the north-west.

Highbury, January 1855.

On the Pendulum Experiment for Illustrating the Rotation of the Earth. By Lieut. Ashe, R.N.

After some geometrical illustrations, the author gives the following description of the pendulum employed by him in these experiments:—

"In the centre of an equilateral plate a small hole was drilled, through which a piece of the best pianoforte wire, a foot in length, was put, fitting tight, and secured to the plate by the wire having a nut screwed on the end of it, and a loop was turned at the other end of the wire. To this steel circular spring a copper wire, stretched and rubbed, was attached; the length of pendulum was 52 feet, and the weight, a leaden sphere, 17 lbs. The plate was firmly screwed to a beam in the steeple of Chalmers' Church of this city (Quebec); the pendulum was protected from any current of air. At about the height of the eye, when sitting down, a wooden circle, 4 inches broad, 3 inches thick, and 8 feet in diameter, was fixed and graduated on the inner edge, so that by placing the eye on a level with the circumference, the time of the wire coinciding with each degree could be noted with great nicety.

"I found steel wire more unsatisfactory in its results than any other sort, in consequence of its being so very sonorous,—so much so, that the noise of a cricket, or any other sound that would harmonise with the wire, produced undulations."

Description of Shepherd's Galvano-Magnetic Regulator.
By Henry S. Ellis.

(*Communicated by Dr. Lee.*)

I beg to forward a description of the galvano-magnetic regulator and apparatus, which have been manufactured by the

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patentee, Mr. C. Shepherd, of Leadenhall Street, and placed in the Exeter Guildhall, for the purpose of giving hour-signals to the cathedral clock, and denoting uniform time throughout this city. In further explanation of the same I enclose three drawings.*

No. 1 is a general outline of the regulator, and is very similar to the one at the Greenwich Observatory, except that there is no contact-spring in connexion with the hour-wheel, which was found to be unnecessary.

No. 2 is the dial of the regulator, and shows the contact-springs for giving hour-signals to the cathedral clock. The lower pair of springs (A) is brought into contact with each other every hour, when the pin (B) in the minute-wheel presses them together; and similarly the upper pair of springs (C) are brought into contact every minute by the pin (D) in the stud underneath the seconds hand; but the whole circuit, between the batteries and the magnets at the cathedral, is not completed until both the lower and the upper pairs of springs make contact simultaneously; and as seven seconds elapse between the signal and the first blow struck on the bell, the contacts are made in anticipation of the hour, so that the striking shall coincide exactly with time shown by the regulator.

No. 3 is the old striking part of the cathedral clock, and the new galvano-magnetic apparatus which is placed in electric connexion with the regulator. When the hour-signal is given, the armature (A) is drawn down on the poles of the magnets (B B), the perpendicular to it is brought forward, and the hammer (D) falls on the tail of detent (E); the stop-piece (F F) is then released, and the striking train performs its work. The pin-wheel (G) raises the hammer (D) again into its horizontal position in readiness for the next hour.

The whole of the iron work in the new apparatus was made much heavier than is absolutely necessary. At first twenty-four of Smee's batteries were requisite to draw the armatures to the magnets; but by lessening the weight of the hammer (C) and the counterpoise (H), it has been found that nine of the same batteries are sufficient—although, to guard against a want of power, and to prevent the necessity of frequent charging, a larger number is now applied. Other parts might be made considerably lighter, and were that done probably about six batteries would be sufficient.

It may be remarked, that if a simple galvanometer could be attached to show the waste of battery power it would be a great convenience.

It is proposed to place a large electric dial, or dials, on the exterior of the Guildhall, and some of the distant parishes have it in contemplation to purchase new clocks, and to put them in connexion with the Guildhall regulator. Indeed, I believe it would

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* See Illustrations at the end of this Notice.

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be practicable to connect all the existing old clocks and dials with it, at a trifling cost beyond that of laying down the electric wires.

When the Electric Telegraph Company bring their wires into the city, it is hoped that they will give the Exonians the benefit of one of the Astronomer Royal's daily signals—the deflection of a needle in immediate proximity to the regulator would be sufficient. For the present a 12-inch sympathetic dial of Shepherd's in my own observatory reports to me the performance of the regulator; and there will be little difficulty in making all the public clocks indicate and strike Greenwich mean time, within a second, throughout the year.

In conclusion, I have to acknowledge, with my very best thanks, the readiness with which the Dean and Chapter permitted the cathedral clock to be connected with the Guildhall regulator; and also the cordial support received from the Right Worshipful the Mayor, the Town Council, and others interested in the carrying out of these chronometrical arrangements.

Exeter, November 8, 1854.

Observations of the Solar Spots. By Dr. Wolf.

1854.	Days of Observation.	Days free of Spots.	Number of new Groups in the Month.
January	23	4	4
February	22	6	4
March	29	6	7
April	25	2	6
May	28	7	7
June	30	1	9
July	29	4	7
August	30	4	4
September	30	5	7
October	24	8	5
November	16	0	4
December	18	4	4
	304	51	68

The following table exhibits a synopsis of the condition of the sun during the last six years, in regard to the relative mean number of groups of spots visible on his disk in each month of the year. In order to take some account of the magnitude of the groups, the results are increased by one-tenth of the number of spots visible.